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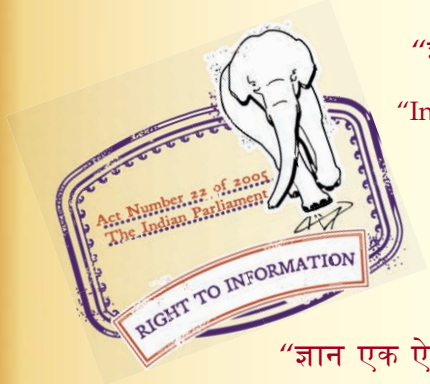

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भाग 12 एनआईसीएएम दो चैनल वाली डिजिटल ध्वनि प्रणाली का उपयोग करते हुए बहु चैनल ध्वनि दूरदर्शन अभिग्रहियों पर विद्युत मापन

Indian Standard

METHOD OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSION

PART 12 ELECTRICAL MEASUREMENT ON MULTICHANNEL SOUND TELEVISION RECEIVERS USING THE NICAM TWO-CHANNEL DIGITAL SOUND SYSTEM

ICS 33.160.25

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 2000

Price Group 7

NATIONAL FOREWORD

This Indian Standard (Part 12) which is identical with IEC 60107-5 (1999) 'Recommended methods of measurements on receivers for television broadcast transmissions — Part 5 : Electrical measurements on multichannel sound television receivers using the NICAM two-channel digital sound-system' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Radiocommunication Sectional Committee and approval of the Electronics and Telecommunication Division Council.

In the adopted standard, certain conventions are not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

CROSS REFERENCES

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated.

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60107-1 : 1997 Methods of measurement on receivers for television broadcast transmissions — Part 1: General considerations — Measurements at radio and video frequencies	IS 4545 (Parts 1 to 8):1983 Methods of measurement on receivers for television broadcast transmission	Technically Equivalent
IEC 60107-2 : 1997 Methods of measurement on receivers for television broadcast transmissions — Part 2 : Audio channels— General methods and methods for monophonic channels	IS 4545 (Part 9):1983 Methods of measurement on receivers for television broadcast transmissions: Part 9 Electrical and acoustic measurements at audio frequencies	do
IEC 60268-1 : 1985 Sound system equipment—Part 1 : General	IS 9302 (Part 1):1979 Characteristics and methods of measurements for sound system equipment: Part 1 General	do

The concerned Technical Committee responsible for the preparation of this standard has reviewed the provisions of the following International Publications and has decided that they are acceptable for use in conjunction with this standard.

ITU-R Recommendation BT.470-5:1998 Conventional television systems

ITU-R Recommendation BS 707-3:1998 Transmission of multi-sound in terrestrial television systems PAL B, G, H and I, and SECAM, K, K1 and L

ITU-T Recommendation J.17:1972 Pre-emphasis used on sound-programme circuits

Only the English language text of the International Standard has been retained while adopting it in this Indian Standard.

Indian Standard

METHOD OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSION

PART 12 ELECTRICAL MEASUREMENT ON MULTICHANNEL SOUND TELEVISION RECEIVERS USING THE NICAM TWO-CHANNEL DIGITAL SOUND SYSTEM

1 Introduction

1.1 Scope

The methods of measurement described in this part of IEC 60107 apply to television receivers designed for the reception of television broadcasts sing the two-channel digital sound system. The sound coding-system is based in NICAM 728 and is transmitted by a quadrature phase-shift keying (QPSK) modulated digital subcarrier.

NOTE – NICAM 728 is the abbreviated form of Near Instantaneous Companded Audio Multiplex at 728 kbit/s.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60107. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60107 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60107-2:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 2: Audio channels – General methods and methods for monophonic channels*

IEC 60268-1:1985, *Sound system equipment – Part 1 : General*

ITU-R Recommendation BT.470-5:1998, *Conventional television systems*

ITU-R Recommendation BS 707-3:1998, *Transmission of multi-sound in terrestrial television systems PAL B, G, H and I, and SECAM D, K, K1 and L*

ITU-T Recommendation J.17:1972, *Pre-emphasis used on sound-programme circuits*

2 General explanation of terms

The digital sound system offers the possibility of audio transmission using several different modes of operation:

Dual sound: transmission of two independent sound signals.

Stereophonic: transmission of a left and right channel sound signal.

Nonoaural: transmission of monoaural signal.

3 General notes on measurements

The decoder for this sound system is generally integrated into a television receiver and it is not always possible to measure the data before the D/A converter.

3.1 General conditions

Unless otherwise stated, measurements shall be carried out under the conditions described in IEC 60107-1 and IEC 60107-2.

3.2 Setting of the receiver

3.2.1 Introduction

Measurements should be carried out in accordance with the following conditions to ensure measurement reliability.

3.2.2 Standard output power and voltage

3.2.2.1 Standard output power for loudspeaker

The standard output power shall be a power 10 dB below the rated output power (see 3.1 of IEC 60107-2). Alternatively, a stated, preferred value of output power, not directly related to the rated value, may be used; the preferred values are 500 mW, 50 mW and 5 mW. The corresponding levels are 27 dB(mW), 17 dB(mW) and 7 dB(mW), respectively. In all cases, the value chosen shall be stated with the results.

3.2.2.2 Standard line output voltage

The standard output voltage at a line output terminal shall be 500 mV r.m.s. at 1 kHz when terminated with a resistor equal to the rated load impedance.

NOTE – If the output is not adjustable, the output voltage when the standard r.f. television signal is applied to the receiver at the r.f. input signal level specified in 3.2.6, should be used as the standard output voltage.

3.2.3 Setting of tone controls

Unless otherwise stated, the tone controls that have an influence on the frequency characteristics shall be adjusted for a practically flat response characteristic at the volume control position specified for the measurement. If the volume control is physiologically weighted (loudness control) and the compensation cannot be switched off, it shall be set for minimum compensation effect and the standard output power obtained by adjusting the audio input level and this value stated with the results.

3.2.4 Setting of stereo balance control

Unless otherwise specified, the balance control(s) shall be adjusted so that the output powers of the two channels are of the same value at the volume control position specified for measurement.

3.2.5 Receiver tuning

Tuning shall be done in accordance with by 3.6.3 of IEC 60107-1 and shall remain unaltered during the whole series of measurements. The criteria used according to 3.6.3 of IEC 60107-1.

3.2.6 Radio frequency signals

Unless otherwise stated, a standardized colour TV signal (ITU-R Recommendation BT.470-5) with two-channel digital sound system (ITU-R Recommendation BS.707-3) and a colour bar video modulation shall be used. The r.f. input level of the receiver (the r.m.s. value of the picture carrier during the sync pulse interval) shall be set at 70 dB (μV) across 75 Ω. The amplitude of the residual carrier at peak white level shall be between 10 % and 12,5 % of the picture carrier amplitude. The FM carrier shall be modulated with an audio frequency sine wave signal of 1 kHz, and a modulation factor of 30 %.

A representation of the complete r.f. signal generator including the digital sound signal and the arrangement for measuring the r.f. signal levels, is shown in figure 1. A representation of a basic NICAM receiver is shown in figure 2.

3.3 Test signals

3.3.1 Audio test signals

The audio test signals necessary to perform the test described in this document are defined as follows:

Frequencies: 40 Hz to 15 kHz. If the test generator only provides a given number of discrete frequencies they should be:

40 Hz, 100 Hz, 200 Hz, 500 Hz et 1 kHz, 2 kHz, 5 kHz, 7,5 kHz, 10 kHz, 12 kHz, 14 kHz.

Amplitude: The test signal applied to the NICAM coder shall be corrected in accordance with the pre-emphasis (ITU-T Recommendation J.17), see figure 9.

All amplitudes of the test signals are referred to full scale.

Full scale is defined, for a digital signal, as the maximum signal in accordance with the encoding system specification. Full scale amplitude is defined after pre-emphasis and is the same for all frequencies after encoding.

3.3.2 Data test signal

The data test signal is a pseudo random binary sequence (PRBS). The sequence shall have more than 15 stages.

3.4 Measuring instrument

3.4.1 RF test signal generator

The test generator shall be capable of providing a radio frequency signal as specified in 3.2.6. The digital sound part of the test generator shall have separate data and clock inputs to QPSK modulator. An example of the test generator is shown in figure 1.

3.4.2 Audio signal generator

The audio signal generator shall be capable of providing signals as specified in 3.3.1.

3.4.3 Pseudo-random binary sequence (PRBS) generator and bit error rate counter

The equipment shall be able to handle the PRBS signal specified 3.3.2.

3.4.4 Oscilloscope

The oscilloscope shall have dual trace and frequency range 40 Hz to 15 kHz.

3.4.5 Distortion and level meter

Frequency range 40 Hz to 15 kHz.

3.4.6 Quasi-peak voltmeter and weighting filter

The quasi-peak voltmeter and the weighting filter are described in 2.5.4 of IEC 60107-2.

4 Methods of measurements

4.1 Bit error rate due to the input signal level

4.1.1 Definition

This test measures the bit error rate of a digital sound signal due to the input level of the television receiver. The digital signal will be influenced by random noise when the input signal is decreased.

4.1.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 3.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The digital carrier is modulated with a PRBS signal. The PRBS signal is applied to the data-input of the QPSK modulator.

c) The measurement is made at the interface between the QPSK demodulator and the NICAM decoder.

d) The complete r.f. signal including the digital signal is applied to the receiver (figure 1).

e) Measure the bit error rate on the data output of the QPSK demodulator. It may be necessary to make a special adapter to match the impedance and signal level from the data and clock output.

f) Decrease the input level and repeat the bit error rate measurement.

4.1.3 Presentation of results

The result shall be presented graphically and/or listed in a table for the different input signal level values.

4.2 Bit error rate due to different deviations of the analog FM carrier

4.2.1 Definition

This test measures the bit error rate of a digital sound signal due to the deviation of the analogue FM carrier. The filtering of the digital sound carrier will be tested with this measurement.

4.2.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 3.

The method of measurement is the same as for 4.1.2 items a) to e).

Change the deviation on the analogue FM signal in the range between 5 kHz and 50 kHz and repeat the bit error rate measurement.

4.2.3 Presentation of results

The result shall be presented graphically and/or listed in a table for the different deviations of the analog FM carrier.

4.3 Bit error rate due to adjacent upper channel

4.3.1 Definition

This test measures the bit error rate of a digital sound due to the influence of the adjacent upper television channel. The filtering of the digital sound carrier will be tested with this measurement.

4.3.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipments is shown in figure 4.

The method of measurement is the same as for 4.1.2 items a) to e).

The adjacent channel is a normal television channel under specified in IEC 60107-1 and IEC 60107-2 except for the filtering. The characteristic of the sideband shall be in accordance with figure 8. The signal level is equal to the wanted channel. The video test signal is a frequency sweep from 100 kHz to 5 MHz, the picture level is 100 % black to white.

Change the level of the adjacent television carrier and repeat the bit error rate measurement.

4.3.3 Presentation of results

The result shall be presented graphically and/or listed in a table for the different signal level values in the adjacent channel.

4.4 Audio click perceptibility in presence of noise

4.4.1 Definition

This test determines the noise level at which clicks appear on the audio outputs. It can be an alternative method for characterizing the data recovery function in case bit error rate information is not available.

4.4.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 1.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the stereo sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate channel A and B with audio test signals. Frequency range: 40 Hz to 15 kHz. Amplitude: full scale minus 11 dB (see figure 9).

e) Decrease the r.f. input level until the clicks become just audible.

f) The level of the input signal is the result of the measurement.

4.5 Audio frequency response characteristics

4.5.1 Definition

This test measures audio frequency response characteristics of each audio channel.

4.5.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 6.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the dual-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate channel A with an audio test signal. Frequency range: 40 Hz to 15 kHz. Amplitude: Reference, full scale minus 20 dB at 1 kHz (see figure 9).

e) Set the receiver for channel A.

f) Measure the level at 1 kHz on the right output channel with a selective volt meter. Change the audio frequency within the range specified above keeping the amplitude the same as the reference. Measure the output level changes relative to the measurement at 1 kHz. Measure also the output level at frequencies mirrored with respect to half the sampling frequency.

g) Repeat item f) for the left output channel, and items d) to f) for channel B.

4.5.3 Presentation of results

The results shall be presented in a table or as a graph.

4.6 Harmonic distortion

4.6.1 Definitions

See IEC 60107-2, clause 40.

4.6.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 6.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the dual-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate channel A with an audio test signal. Frequency range: 40 Hz to 7,5 kHz. Amplitude: full scale minus 11 dB (see figure 9).

e) Set the receiver for channel A.

f) Measure the harmonic distortion on the right output channel with a distortion meter. The measurement shall be made on frequencies within the range specified above.

g) Repeat item f) for the left sound channel, and items d) to f) for channel B.

4.6.3 Presentation of results

The result shall be presented graphically and/or listed in a table.

4.7 Dynamic range of sound channel

4.7.1 Definition

This test measures the dynamic range of each sound channel. The dynamic range of a digital system will be obtained by measuring the level of quantizing and random noise at low level modulation.

4.7.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 6.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the dual-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate channel A with audio test signal. Frequency: 1 kHz. Amplitude: full scale minus 60 dB.

e) Measure quantizing and random noise level in the output signal on the sound channel with a distortion meter, tuned to 1 kHz.

f) Calculate the dynamic range by the following equation:

$$\text{dynamic range} = L_{aL} + 60 \text{ dB}$$

where L_{aL} is the noise level relative to the signal level.

g) Repeat items d) to f) for channel B.

4.7.3 Presentation of the results

The results shall be presented in a table.

4.8 Crosstalk

4.8.1 Definition

This test measures the crosstalk between the audio channels in stereo mode. This test is valid also for duel-channel mode.

4.8.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 6.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the stereo-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate the right channel with an audio test signal. Frequency range: 40 Hz to 15 kHz. Amplitude: full scale minus 11 dB (see figure 9).

e) Set the audio frequency to 1 kHz.

f) Measure the output level, which is designated as u_1, on the right channel of the receiver. Measure the output level on the left channel, which is designated u_2.

g) Calculate crosstalk by the following equation:

$$\text{crosstalk} = 20 \log (u_2/u_1) \text{ dB}$$

h) Change the audio frequency to other frequencies specified above and measure the crosstalk in the same way.

4.8.3 Presentation of results

The result shall be presented in a table or as a graph.

4.9 Phase differences between left and right channel

4.9.1 Definition

This test measures the phase difference between the left (L) and right (R) channels at the stereo output.

4.9.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 7.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the stereo-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Modulate the left and right channels with an audio test signal. Frequency: 1 kHz. Amplitude: Reference, full scale minus 20 dB at 1 kHz (see figure 9).

e) Display the signal from the L and R receiver output, on an oscilloscope. The oscilloscope shall be triggered by the L or R signal exclusively.

f) Measure the phase difference between L and R.

g) Repeat Items d) to f) for other frequencies within the specified band. The amplitude is the same as the reference (see figure 9).

4.9.3 Presentation of results

The result shall be presented in a table or as a graph.

4.10 Signal-to-noise ratio of audio signals

4.10.1 Definition

This test measures the weighted signal-to-noise ratio of each sound channel signal caused by analogue parts of the decoder.

4.10.2 Method of measurement

Measurement shall be made under the following conditions and procedures. The arrangement of the test equipment is shown in figure 5.

a) The receiver is brought under standard measuring conditions as specified in 3.2.

b) The NICAM coder is set in the dual-sound mode.

c) The complete r.f. signal including the digital sound signal is applied to the receiver (figure 1).

d) Set the receiver for channel A.

e) Set the position of the switch to 1 and measure output level of the right sound channel with a noise weighting filter and a quasi-peak voltmeter when no modulation is present at the sound channel (see 3.4.6).

f) Modulate channel A with a audio test signal. Frequency: 1 kHz. Amplitude: full scale minus 11 dB (see figure 9).

g) Set the position of the switch to 2 and adjust the attenuator until the quasi-peak volt meter gives the same reading as measured in item e).

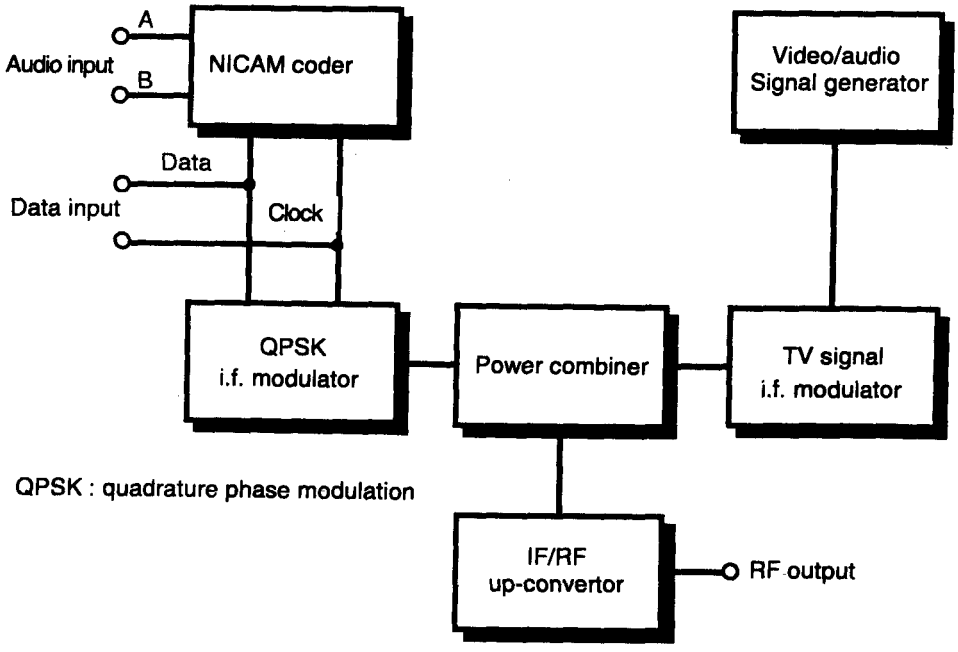
h) The attenuation gives the value of signal-to-noise ratio of the sound channel.

i) Repeat items e) to h) for the left channel, and items d) to h) for channel B.

NOTE – As an alternative to the use of the noise weighting filter and quasi-peak volt meter specified in 3.4.6, an A-weighting filter and true r.m.s. meter can be used (see IEC 60268-1). If this alternative method is used it shall be stated with the results.

4.10.3 Presentation of results

The results shall be presented in a table.



NOTE – ITU-T Recommendation J.17 pre-emphasis is used.

Figure 1 – RF test signal generator including digital signal

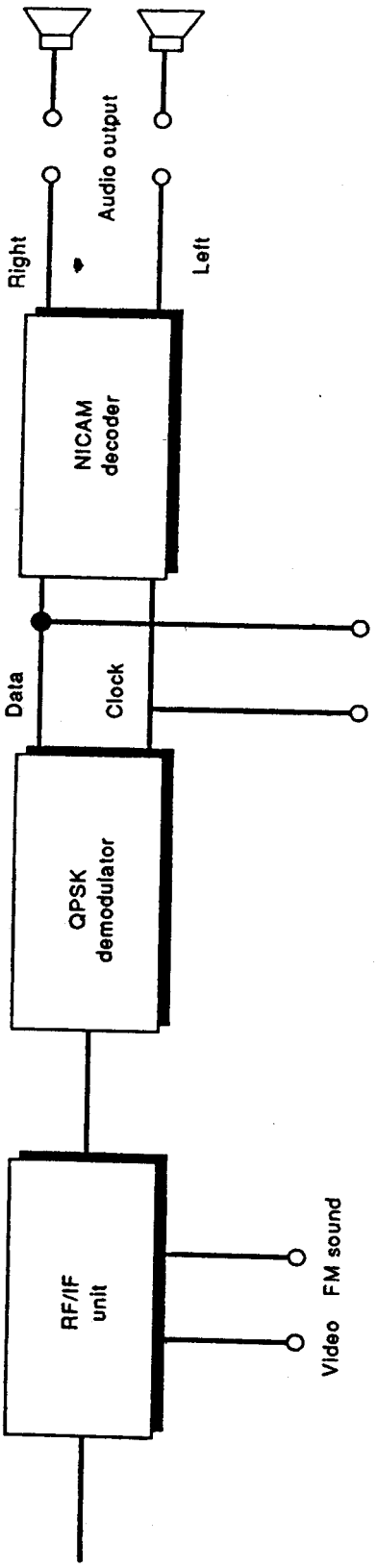


Figure 2 – Receiver

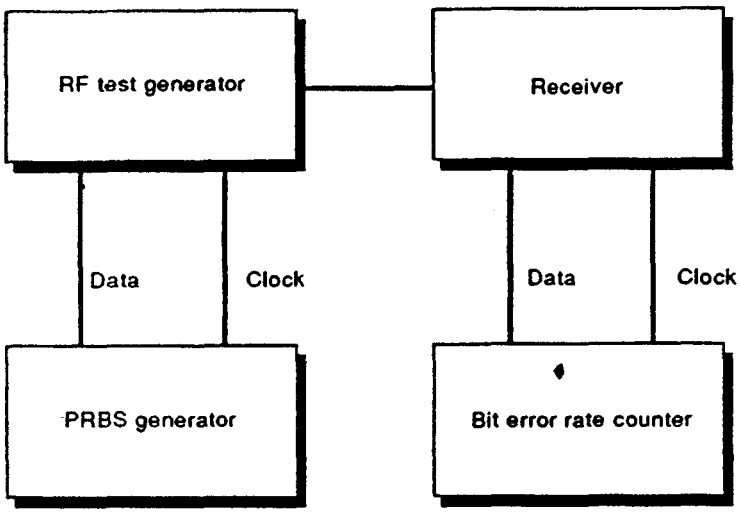


Figure 3 – Arrangement for bit error rate measurement

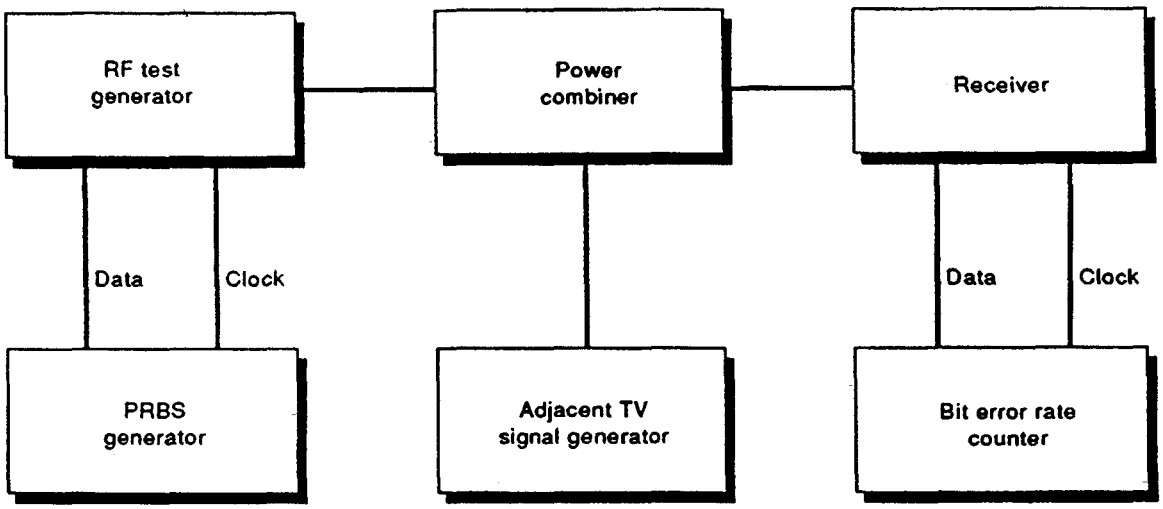


Figure 4 – Arrangement for bit error rate measurement with adjacent channel

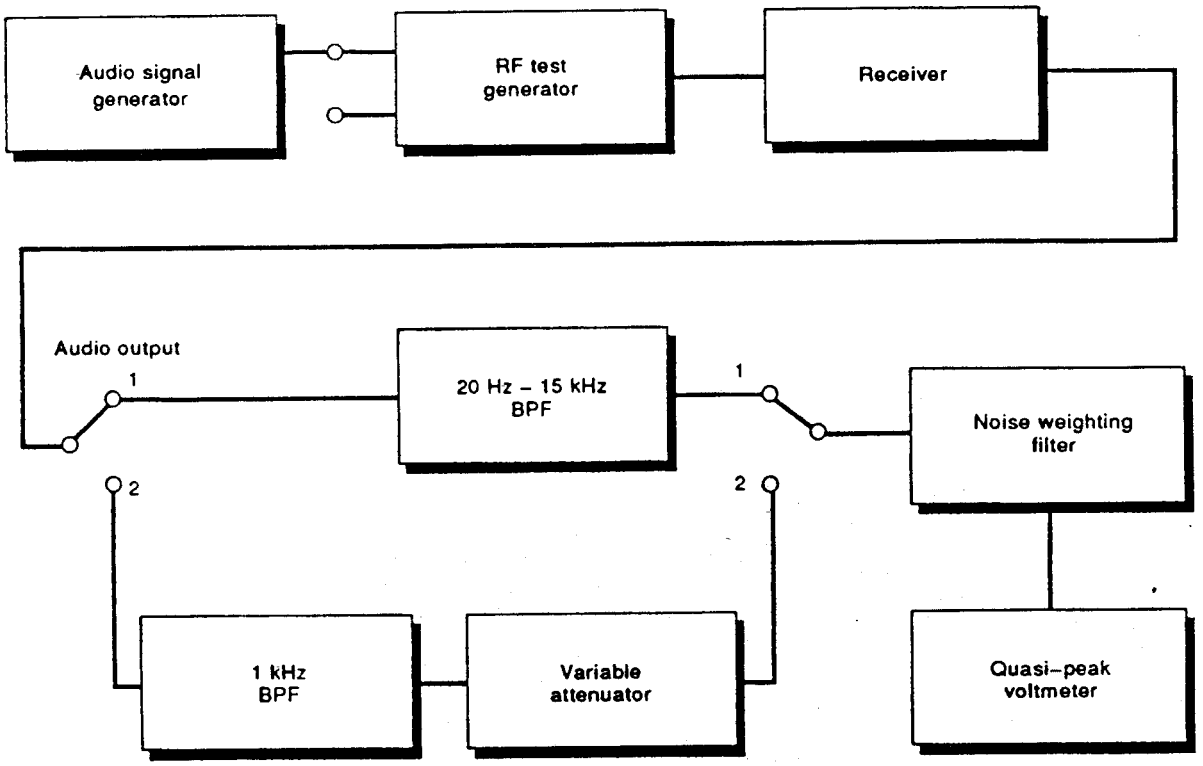


Figure 5 – Arrangement for signal-to-noise measurements

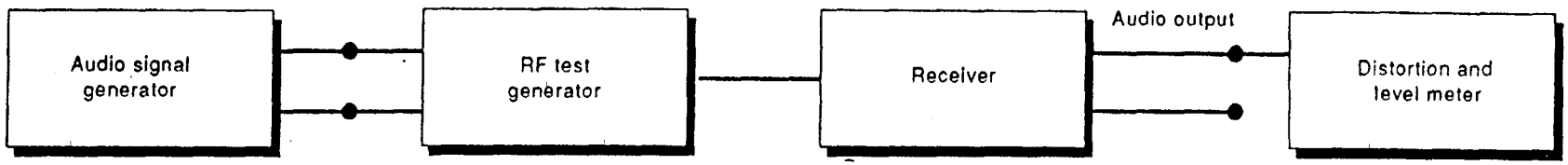


Figure 6 – Arrangement for dynamic range, audio frequency characteristic, harmonic distortion and crosstalk measurements

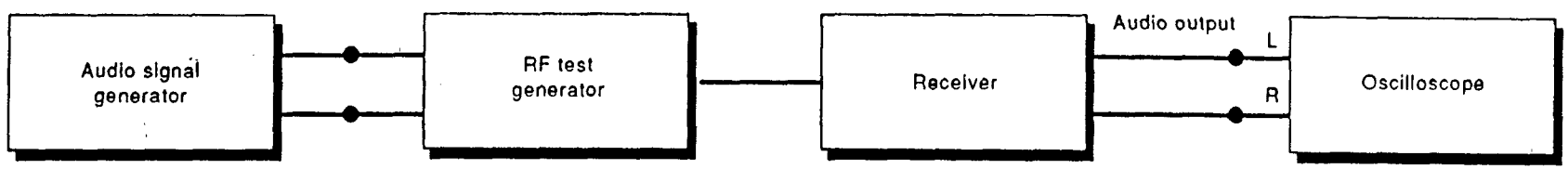


Figure 7 – Arrangement for measurement of the phase difference between left and right channels

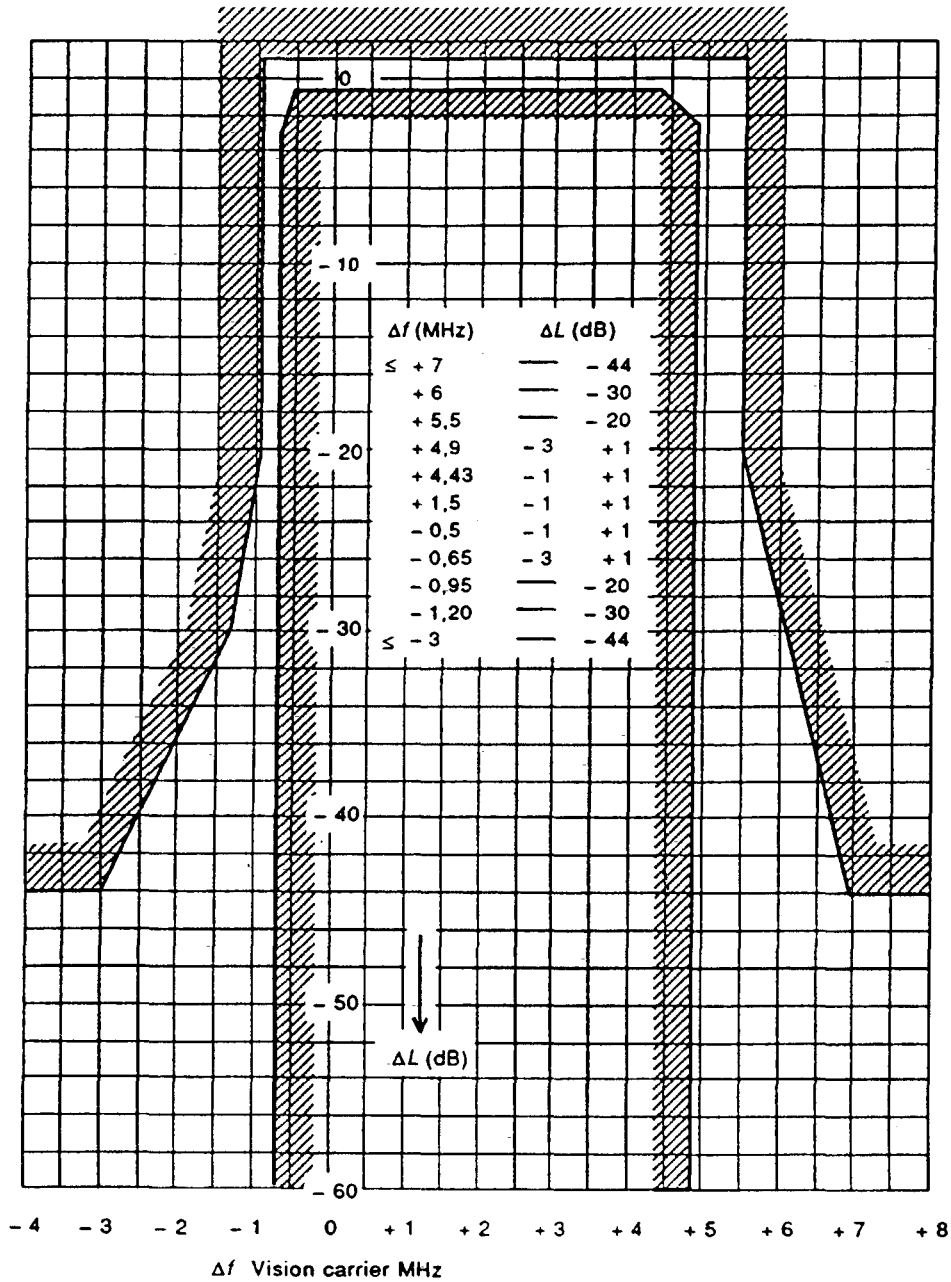


Figure 8 – Filter characteristic for adjacent TV channel (system B)

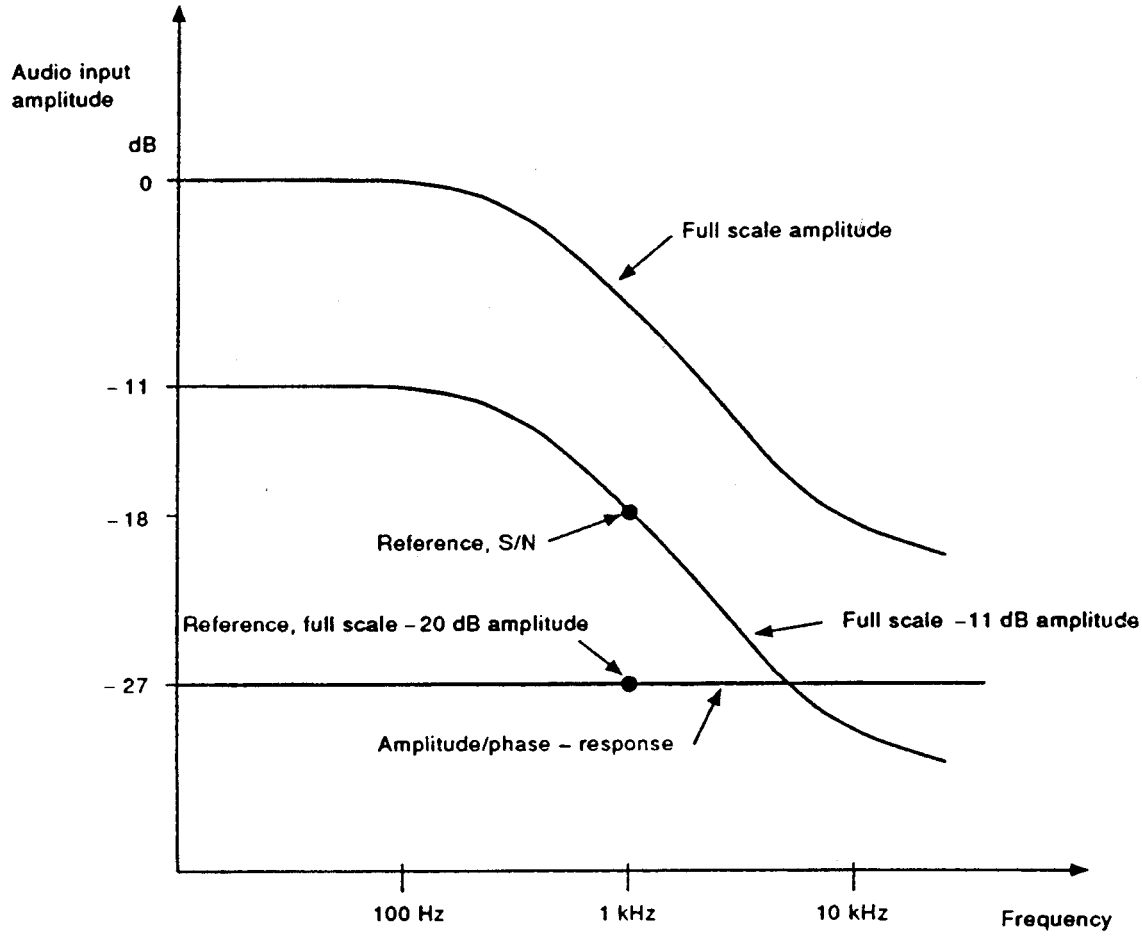


Figure 9 – The signal amplitude at audio input

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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